

F.R.L
F (Filtr)
R (Reg)
L (Lub)
PresSW
Shutoff
SlowStart
FimResistFR
Oil-ProhR
MedPresFR
No Cu/ PTFE FRL
Outdrs FR
F.R.L (Related)
CompFRL
LgFRL
PrecsR
VacF/R
Clean FR
ElecPneR
AirBoost
SpdContr
Silncr
CheckV/ other
Jnt/tube
AirUnt
PresCompn
Mech/ ElecPresSw
ContactSW
AirSens
PresSW Cool
AirFloSens/ Contr
WaterRtSens
TotAirSys (Total Air)
TotAirSys (Gamma)
RefrDry
DesicDry
HiPolymDry
MainFiltr
Dischrg etc
Ending



Pneumatic components (F.R.L. unit (Compact))

Safety Precautions

Be sure to read this section before use.

Refer to Intro Page 63 for general precautions regarding pneumatic components and refer to “ ⚠ Safety precautions” for detailed precautions for individual series.

Product-specific cautions: Compact regulator RB500 Series

Design/selection

⚠ CAUTION

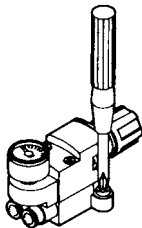
- Avoid using this product where strong pulsations of pressure or vibration are applied.
- When installing between a solenoid valve and actuator, avoid use of this product in a circuit where back pressure is applied.
- Differential pressure between primary and secondary sides is to be 0.1 MPa or more.

- Usage may not always be possible in a sealed circuit at the secondary side or in a balance circuit and so consult with CKD.
- Output pressure exceeding the regulator’s set pressure could result in damage or faulty operation of the secondary side devices. Be sure to install a safety device.
- Avoid use in applications released into the atmosphere.

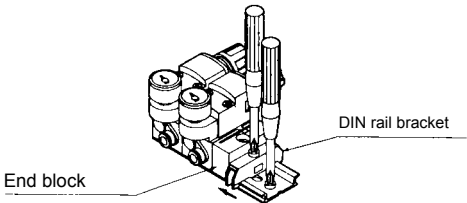
Mounting, installation and adjustment

⚠ CAUTION

- When transporting or installing the product, do not drop it. Failure of indicator accuracy may occur.
- Do not install the product in a location with high temperatures or high humidity. Otherwise, malfunctions may result.
- When installing a pressure gauge, be sure to use a wrench on the tang. If another section is used, air leakage or damage could result.
- When installing or piping, observe the following points.
 - Confirm the direction of the IN arrow indicating the air inlet before connecting. A reverse connection could result in improper operation.
 - Do not move or swing the product by the pressure adjustment knob.
 - When installing a compact regulator, use M4 plain washer attached screws, and fix with tightening torque of 1.4 to 2.0 N·m or less.



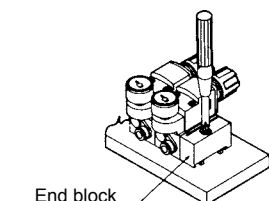
- When installing a block manifold with DIN rail, fix the DIN rail while fixing the bracket between the manifold end blocks.
Recommended tightening torque of DIN rail bracket is 1.4 to 2.0 N·m. Fix DIN rail bracket, while making no gaps between end blocks. Care must be taken when expanding, maintaining or disassembling regulator blocks.



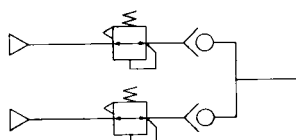
- Do not install this product in a location where it may be subject to vibrations or shocks.
- Before mounting the air pipe to be used, flush it out well.
- Tighten with 3.5 N·m or less tightening torque when mounting a pressure gauge or a fitting for external porting to the pressure gauge mounting board

- When installing the product directly without using DIN rail (direct mount), fix end blocks on both sides with M4 set screws.

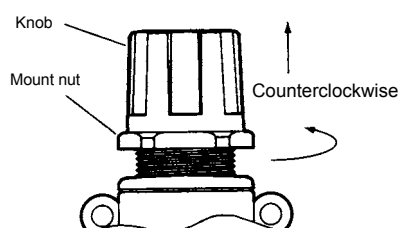
Recommended tightening torque is 1.4 to 2.0 N·m. Install the product on a fully flat surface. If the seating surface is small, external pressure from above may damage the manifold connection section. If a flat seating plane is not available, use DIN rail mount.



- When using in parallel as below, the OUT side of the circuit must not be closed. If a closed circuit is required, be sure to install a check valve on each OUT side.



- When installing on a panel, loosen the mounting nut; it will function as a jack and make the knob easily removable. Fix the product on a panel with a mount nut.



- A push-in fitting is used for the regulator piping. The tube may come off or air leakage may occur depending on diametric accuracy, wall thickness, or hardness of piping tube. Use a CKD specified tube. When mounting or dismantling a fitting, press the release ring evenly, then pull out the tube without twisting it. To reuse the tube, cut the section scored by the chuck jaw.

Tube	O.D. (mm)	Outer ϕ -tolerance (mm)	Bore size (mm)	Min. bending range (mm)
Soft nylon F-1500 Series	$\phi 4$	± 0.1	$\phi 2.5$	10
	$\phi 6$		$\phi 4$	20
	$\phi 8$		$\phi 5.7$	30
Urethane U-9500 Series	$\phi 4$	+0.1 -0.15	$\phi 2$	10
	$\phi 6$		$\phi 4$	20
	$\phi 8$	+0.1 -0.2	$\phi 5$	30
Urethane NU Series	$\phi 4$	± 0.1	$\phi 2.5$	8
	$\phi 6$		$\phi 4.5$	15
	$\phi 8$		$\phi 6$	24

- Securely insert piping tube into push-in fitting and check that tube does not dislocate before use.
- Cut the push-in fitting tube at right angles with a dedicated tool.

Use/maintenance

CAUTION

Working air quality

- Use clean compressed air filtered with a 5 μ m air filter.
- Use only compressed air. Air containing corrosive gases, fluids or chemicals could result in improper pressure adjustment due to body damage or rubber swelling.
- Service life could be shortened due to splashed lubricant and rubber part deterioration when using ultra dry air.

Working environment

Avoid using the products in the following environments.

- When ambient temperature exceeds the range of 5 to 60°C.
- Places where the unit will be exposed to dripping water and/or cutting oil.
- Highly humid places where dew condenses due to temperature fluctuations.
- Where salt air or splashing seawater contacts the product.
- In atmospheres containing corrosive gases, liquids and chemicals.
- Where the product is exposed to direct sunlight.

Pressure management

- Turn the pressure adjustment knob clockwise to increase the secondary pressure and counterclockwise to lower the pressure. When adjusting the pressure, pull up the knob to check that the lock is not applied.
- Pressure higher than the primary pressure cannot be set.
- Set the regulator pressure setting to increase. After setting the pressure, lock the pressure adjustment knob.

F.R.L. Product-specific cautions: Inline filter FSL series

Design/selection

⚠ WARNING

- The filter's clear cover is made of special polyester resin. Avoid using in an atmosphere containing chemicals (see below) or in a place where these chemicals could come in contact as there is a risk of damage.

Chemical name

Chemical name
All alcohols
Paint thinner
Carbon tetrachloride
Chloroform
Acetic ester
Aniline
Cyclohexane
Trichloroethylene
Sulfuric acid
Lactic acid
Water-soluble cutting oil (alkaline)

* There are other chemicals which cannot be used. Contact CKD regarding details.

⚠ CAUTION

- Avoid installing this product where it is subject to direct ultraviolet.
- Note that when using in a circuit where vacuum and vacuum burst air are alternately applied, the dust removed by the element could be discharged by the burst air.

Mounting, installation and adjustment

⚠ WARNING

- Do not apply tensile, torsion, or bending loads to the body. Do not drop or apply excessive impact. The body could break or come apart.

⚠ CAUTION

- Check the arrow indicating the air flow on the body before connecting the pipes. The filter functions will not be satisfied if the pipes are connected in reverse.
- After removing the dust and replacing the element, securely fix the case and confirm that there are no leaks.

Use/maintenance

⚠ WARNING

- Always lock the slide lock during use.

⚠ CAUTION

- Periodically perform maintenance and inspection. A clogged element could decrease performance and cause other problems.

- When disassembling or assembling for maintenance, make sure that the O-ring is not damaged. Use of a damaged O-ring could result in problems such as leaks.

- When rotating the fitting body for disassembly or assembly, make sure not to apply excessive force with the tools, etc. The body could break.



Pneumatic components (F.R.L. unit (Compact))

Safety Precautions

Be sure to read this section before use.

Refer to Intro Page 63 for precautions for general pneumatic components.

Individual precautions: F.R.L. unit (Compact)

Design/selection

1. Common

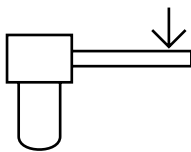
⚠ WARNING

- The air filter, lubricator plastic bowl, lubricator drip window and pressure gauge lens are all made of polycarbonates. They cannot be used in environments containing synthetic oil, organic solvents, chemicals, cutting oil, screw locking agent, leak detection solutions, or hot water, etc., or where these substances may come in contact with the product. Refer to page 366 for details on plastic bowl chemical resistance.

■ Piping load torque

Avoid applying piping load or torque to the body or pipes.

	Rc1/8, Rc1/4
Max. torque N·m	15



⚠ CAUTION

■ High moisture levels

Install the air dryer and drain separator before the air filter. If there is a lot of moisture from the compressor, hot and highly humid air could shorten the device's life or result in corrosion.

■ Ultra dry air

Rubber parts for the regulator could deteriorate quickly, so use of a fluoro rubber valve assembly is recommended. Contact CKD when required.

■ Water-lubricated compressor circuit

Take measures to prevent chlorine-based substances from entering the compressed air.

■ Piston drain "D"

- Set the working pressure to 0.1 MPa or more.
- Do not use this device on equipment that experiences impacts.
- Automatic discharge used for intermittent flow. Drainage is not discharged under working conditions where air flows constantly.

2. Filter

⚠ WARNING

- The miniature (A1019, B7019, A3019) bowl does not have a bowl guard. Provide a guard on the device, etc., for safety.

⚠ CAUTION

- Do not select using the port size.

- Use a pre-filter before the micro alescra filter/micro-naught. Use a filter (5 µm) or submicron filter as the pre-filter.

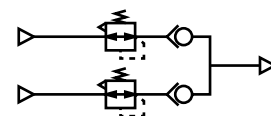
3. Regulator, F.R. unit

⚠ WARNING

- Output pressure exceeding the regulator's set pressure could result in damage or faulty operation of the secondary side devices. Be sure to install a safety device.
- The regulator cannot process residual pressure (release secondary pressure) when the primary pressure is released. Use a regulator with a check valve when residual pressure must be processed.
- When using the regulator for secondary side sealed circuits or balance circuits. Contact CKD regarding these applications.

⚠ CAUTION

- The setting range for the regulator's secondary-side pressure should be within 85% of that of the primary side.
- After setting pressure, do not release primary pressure or depressurize.
- When using regulators in parallel as below, do not use the OUT side as a closed circuit. If a closed circuit is required, install a check valve on the OUT side of each regulator.



- For miniature types (B2019, 2419, B6061, B7019), turning the knob in the L direction from the set pressure 0 activates the stopper and the knob does not turn. Note that if torque is forcibly applied in the L direction, the knob may lock and become inoperable.

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AirUnt
PrecsCompn
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4. Lubricator

⚠ WARNING

- Consult with CKD regarding using lubrication with an air motor or bearings. Also consult with CKD when using this unit at a high frequency, such as in a press machine.

⚠ CAUTION

- If the working air quantity is low for the lubricator, oil may not drip.
Check the min. air quantity required for dripping oil.
- Check that the bowl is not pressurized before supplying oil. Check that the oil level in the bowl is between the upper and lower limits.

5. Relief valve

⚠ CAUTION

- When using released to the atmosphere, restrict the pressure before releasing.

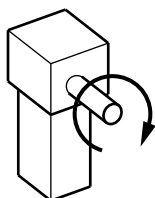
Mounting, installation and adjustment

1. Common

⚠ CAUTION

- Using the F.R.L. correctly
 - Avoid installing this product where it is subject to direct ultraviolet.
 - Set the regulator pressure setting upward. After setting the pressure, lock the handle. Check primary pressure carefully before setting pressure.
 - Check the arrow indicating the air inlet before connecting. A reverse connection could result in improper operation.
 - Install the air filter and lubricator vertically with the bowl facing downward. Drainage may be defective or drip check may become impossible.
 - Use of the piston drain where vibration is present could cause faults and malfunctions.
- Piping screw-in torque
Make sure that excessive torque is not applied on the body and piping when piping.

	Rc1/8,Rc1/4
Max. torque N·m	30



2. F.R. unit

⚠ CAUTION

- Turn the pressure adjustment handle clockwise to increase the secondary pressure and counterclockwise to lower the pressure.
- Set the pressure while checking primary pressure.
- If the pressure cannot be adjusted, check the valve assembly for the adherence of foreign matter, and check the O-ring for damage, etc.

3. Filter

⚠ CAUTION

- When piping, remove cutting oil and rust preventing agent, etc. Failure to observe will obstruct initial performance of the micro naught micro alescerc filter, and shorten its life. Cutting oil and rust preventing agent on the inside of pipes enters compressed air and adversely affects expensive pneumatic components or devices.

4. Regulator, F.R. unit

⚠ CAUTION

- Note that for B7019, B2019, 2419 and B6061, if the knob is forcibly rotated in the L direction, it may lock.

Use/maintenance

1. Common

⚠ WARNING

- Check the air filter, lubricator plastic bowl and lubricator drip window for cracks, damage and other deterioration.
Replace the bowl with a new plastic or metal one and new window if you find any damage.
- Check the air filter, lubricator plastic bowl and lubricator drip window periodically for contamination.
 - If parts are heavily contaminated or if transparency has decreased, replace with a new bowl or drip window.
 - Use water and household detergent to wash parts. Rinse them out well with clean water afterward.
- Removing bowl of filter and lubricator
Stop the compressed air supply. Release the pressure in the bowls completely and make sure that there is no residual pressure before removing the bowls.
- Assembling parts for maintenance
 - For maintenance, wash parts and assemble without entry of cutting chips or other foreign matter.

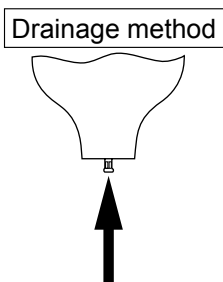
⚠ CAUTION

- Check the oil drip rate once a day.
If the oil drip is faulty, problems could occur in the unit being lubricated.
- Storage
Do not store this product in a hot, humid atmosphere or atmospheric conditions outside of the specified range for a prolonged period of time. Resin or rubber parts could deteriorate, and the resin bowl could become discolored. Contact CKD when storing products exceeding specifications.

2. Filter

⚠ WARNING

- Drain so that air filter moisture does not accumulate beyond the upper limit.
Components could malfunction if moisture flows into the secondary side.

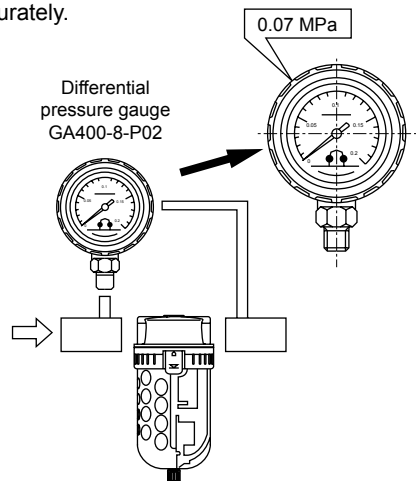


- Drainage starts when the top of the bowl is pressed.
- Ensure that large amounts of drainage do not flow directly from the piping. Install a drain discharger if there is a large amount of direct drainage.

⚠ CAUTION

■ Filter/micro alescser

- Use the differential pressure gauge GA400-8-P02 to measure pressure drop. Measure the pressure drop accurately.

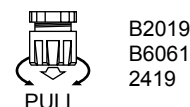


- The micro alescser (oil removal filter) mantle (element) service life is reached when the pressure drops to 0.07 MPa. Replace the mantle with a new one at the end of its life. (Do not touch the urethane foam layer when replacing the mantle.)

3. Regulator

⚠ CAUTION

- Pull the pressure adjustment knob and release the lock before setting the regulator pressure shown below. The regulator could be damaged if the pressure is set without unlocking it. that the knob locks again if it is turned with force in the L direction from the set pressure 0.



- The set pressure changes from the initial set point due to the working environment and conditions, as well as aging of part materials. Check the pressure regularly, and reset if conditions have changed.

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Chemical resistance of plastic

4. Lubricator

⚠ WARNING

■ Use Class 1 turbine oil (no additives) ISO VG32 for the lubricator.
Other oils could cause breakage or improper operation.

■ Periodically replenish oil in the lubricator bowl so that it does not drop below the lower limit.

⚠ WARNING

■ The chemical resistance of plastic parts is shown below.

■ Avoid using products in an atmosphere where chemicals are contained in compressed air or atmosphere, or where they could adhere to parts.

■ Using in the above state could lead to bowl damage and accidents.

■ Avoid use with these types of chemicals or in an atmosphere containing these chemicals.

■ A metal bowl is available if these chemicals must be used.

Chemical resistance of plastic bowl/body Use a metal bowl in an atmosphere containing the following chemicals.
Check whether the testing solutions, sealants and adhesives contain the following chemicals.

Types of chemicals	Categories of chemicals	Main products of chemicals	General applications	Polycarbonate bowl	Nylon bowl	Nylon body
Inorganic chemicals	Acids	Hydrochloric acid, sulfuric acid, hydrofluoric acid, phosphoric acid, chromic acid, etc.	Acid washing of metals, acidic degreasing solution, coating treatment solution, etc.	×	×	×
	Alkalines	Alkalis such as caustic soda, caustic potash, calcium hydroxide, aqueous ammonia, sodium carbonate	Alkaline degreasing solution for metals Soluble cutting oil, leakage detection agent	×	○	○
	Inorganic salts	Sodium sulfide, sodium nitrate, potassium bichromate, sulfate of soda, etc.		×	○	○
Organic chemicals	Aromatic hydrocarbons	Benzene, toluene, xylene, ethyl benzene, styrene, etc.	Contained in paint thinner (benzene, toluene and xylene)	×	×	×
	Chlorinated aliphatic hydrocarbons	Methyl chloride, ethylene chloride, methylene chloride, acetylene chloride, chloroform, trichlene, perchlene, carbon tetrachloride	Organic solvent-based washing solution for metals (trichlene, perchlene, carbon tetrachloride)	×	○	○
	Chlorinated aromatic hydrocarbons	Chlorobenzene, dichlorobenzene, benzene hexachloride (B/H/C), etc.	Agricultural chemicals	×	○	○
	Petroleum components	Solvent naphtha, gasoline, kerosene		×	○	○
	Alcohols	Methyl alcohol, ethyl alcohol, cyclohexanol, benzyl alcohol	Used as antifreezing agent Leakage detection agent	×	×	×
	Phenol	Carbolic acid, cresol, naphthol, etc.	Disinfectant solution	×	×	×
	Ethers	Methyl ether, methyl ethyl ether, ethyl ether	Additive of brake oil	×	○	○
	Ketones	Acetone, methyl ethyl ketone, cyclohexanone, acetophenone, etc.		×	×	×
	Carboxylic acids	Formic acid, acetic acid, butyl acid, acrylic acid, oxalic acid, phthalic acid, etc.	Dyes/oxalic acid for aluminum processing, phthalic acid for paint base and leakage detection agents	×	×	×
	Esters	Dimethyl phthalate (DMP), diethyl phthalate (DEP), dibutyl phthalate (DBP), dioctyl phthalate (DOP)	Lubricant, synthetic coolant, rust preventing agent additive plasticizer for synthetic resin	×	○	○
	Oxyacids	Glycol acid, lactic acid, malic acid, citric acid, tartaric acid		×	×	×
	Nitro compounds	Nitromethane, nitroethane, nitroethylene, nitrobenzene, etc.		×	○	○
	Amines	Methylamine, dimethylamine, ethylamine, aniline, acetanilide, etc.	Additive of brake oil	×	×	×
	Nitriles	Acetonitrile, acrylonitrile, benzonitrile, acetoisonitrile, etc.	Raw material for nitrile rubber	×	○	○

○: Resistant, x: Non-resistant (plastic will become damaged.)

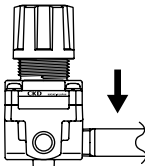
Product-specific cautions: Regulator for water WR1/WR2 Series

Design/selection

⚠ WARNING

- Use the product in the range of conditions specified for the product.
- This product is designed for industrial use. Do not use for medical purposes, or in any equipment or circuit that concerns human life.
- Output pressure exceeding the regulator's set pressure could result in damage or faulty operation of the secondary side devices. Be sure to install a safety device.
- Piping load torque
Avoid applying piping load or torque to the body or pipes.

Max. torque N·m	Rc1/8,Rc1/4	Rc3/8,Rc1/2
	15	50



⚠ CAUTION

- Certain fluids (water quality) can shorten expected useful life to a significant degree. Use general clear water for industrial use. Do not use any liquid or fluid that is intended for the removal of foreign matter or water stains, or that can lead to corrosion or rubber swelling.
- Mesh filters are provided to remove initial foreign matter, such as sealant tape. If it is known that foreign matter is in the fluid, install a strainer before the regulator. Check for clogging in the mesh filters and strainers.
- Pulsation may occur depending on the usage conditions and piping conditions. Lower primary pressure if pulsation occurs.
- Releasing the primary-side pressure may make the secondary-side pressure flow into the primary side. If a problem occurs in another device due to the inflow of secondary-side fluid to the primary side, provide a circuit to retain the pressure.
- The setting range for the regulator's secondary-side pressure should be within 85% of that of the primary side. Otherwise, the pressure drop may increase.

Mounting, installation and adjustment

⚠ CAUTION

- Install the product where it is not exposed to direct sunlight.
- When using this product in a cold climate, take the necessary measures to prevent freezing.
- Flush and clean the pipes. Dirt or foreign matter remaining in the piping will deteriorate product performance.
- Make sure that no foreign matter enters the pipes when connecting the pipes and fittings. When screwing in piping or fittings, check that swarf from port threads or sealant does not get inside. Dirt or foreign matter remaining in the piping will deteriorate product performance.
- Match the flow direction and the direction of the arrow on the product for correct connection. This product does not operate when it is connected in the opposite direction.
- Secure sufficient space for maintenance and inspection.
- Do not install this product in a location where it may be subject to vibrations or shocks.

- Use appropriate torque to hold the body and tighten the pipes when connecting them. (The following table shows the recommended torque values.) The product may be damaged if excessive torque is applied.

Max. torque N·m	M5	Rc1/8	Rc1/4	Rc3/8	Rc1/2
	0.2 to 0.3	18 to 20	23 to 25	31 to 33	41 to 43

- Use a pressure gauge and pipe plug to block the pressure gauge connection port.
- It is recommended that pipes are connected to the breathing port when using this equipment. This ensures safe water discharge even if a crack occurs in the diaphragm due to excessive pressure, pressure fluctuation, or freezing.
- When the panel mounting nut is loosened, the nut acts as a jack and enables the knob to be removed easily. Install the nut before installing the knob.

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⚠ CAUTION

- Do not modify this product.
- Before conducting maintenance, stop the supply of the fluid and make sure that there is no residual pressure.
- Do not store this product in a hot, humid atmosphere or atmospheric conditions outside of the specified range for a prolonged period of time. This can lead to deterioration of the resin and rubber parts.
- Release the lock before adjusting the pressure. Forcibly turning a locked pressure adjustment knob could cause damage.
- Adjust pressure in the direction of the pressure increase. The correct pressure cannot be set if pressure is adjusted downward.
- This product is a non-relief; pressure reduction is not possible without consumption on the secondary side.
- The set pressure changes from the initial set point due to the working environment and conditions, as well as aging of part materials. Check the pressure regularly and reset if conditions have changed.